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ABSTRACT

This paper presents a complex causal model of teacher stress based on data received from the responses of 1,466 teachers from Malmo, Sweden to a questionnaire. Also presented is a method for treating the model variables as higher-order factors or higher-order theoretical constructs. The paper's introduction presents a brief review of teacher stress. The conceptual model is also described. The second section describes data and methods used for creating the model, including population, variables, index construction, higher-order theoretical constructs, and model specification. Results discussed in the third and fourth sections show that: (1) individual personality characteristics, rather than biographical ones, are associated with stress variables; (2) teachers' relationships with pupils are by far the most important source of stress; and (3) social support is ineffective in alleviating reactions to stress exposure. Another conclusion discussed is that a latent variable measuring a syndrome of work dissatisfaction and work overload is very strongly connected to teachers' health as measured by mental disorders and psychosomatic symptoms. Appendices list factor items used in the method. References are included. (JM)

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ABSTRACT. The need to study stress as a multivariate phenomenon has been emphasized by several authors. In this paper a complex causal model of teacher stress is presented. The data are based on a survey of all teachers in one of the major cities of Sweden. The paper presents a method for treating the model variables as higher-order factors or higher-order theoretical constructs. This method allows for a parsimonious design and yet most of the relevant information in the data set is incorporated into it. The main findings are that individual personality characteristics rather than biographical ones are associated with the stress variables, that relations to the pupils are the by far most important source of stress, and that social support is ineffective in alleviating reactions to stress exposure. It is also shown that a latent variable measuring a syndrome of work dissatisfaction and work overload is very strongly connected to the teachers' health as measured by mental disorders and psycho-somatic symptoms.

KEYWORDS. Organizational stress, job stress, teacher stress, higher-order factors, theoretical constructs, structural equation models, LISREL.

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1 INTRODUCTION

Several authors have emphasized the need to study stress as a complex multivariate system. Lazarus and Launier (1978) have claimed that stress should be treated as a relational or transactional concept describing certain kinds of adaptive commerce between any system (e.g., a person) and an environment. A similar viewpoint has been expressed by Newman and Beehr (1979) with regard to occupational stress and by Kyriacou and Sutcliffe (1977a; 1978a) with regard to teacher stress.

In this vein two data sets of Swedish comprehensive school teachers were previously analyzed and reported (Brenner et al., 1981; Tellenback et al., 1981, 1982). The analysis was originally carried out on a National sample and subsequently the findings were replicated as far as possible on a sample of school teachers from Malmö, the third largest city in Sweden. A structural equation method, LISREL, was used to fit empirical models which were based on a general conceptual framework of teacher stress. The main finding of the analysis was that pupils are by far the most important source of stress for Swedish comprehensive school teachers. It was also found that whereas reactions to stress such as general strain (overload), mental disorders, and psycho-somatic symptoms were fairly well explained in the empirical models, the stressors themselves remained very poorly explained. Several individual biographical characteristics were analyzed but, with the exception of sex and age, were shown to be unrelated to the sources of stress and to the stress reactions.

In this study the Malmö data are reanalyzed on the basis of a slightly revised conceptual model. One of the main objectives of the study is to discover the antecedents of the various stressors and in particular those of the pupil related stressor. Since the biographical teacher characteristics have been shown to be unassociated with the stress variables the attempt is made to discover other individual characteristics which contribute to explaining the occurence of stress and stress reactions. With the Malmö data it is also possible to incorporate a specific coping mechanism, namely social support, into the model. Efforts are made, finally, to make the empirical model as parsimonious as possible. It will be demonstrated that this can be accomplished by a gradual reduction of the items and variables into higher-order theoretical constructs.

In the previous studies (Brenner, ibid.; Tellenback, ibid.) it was emphasized that they were exploratory. This study is also mainly explorative in character in the sense that a conceptual model merely serves as a general framework guiding the analysis. Thus the model is not specified in detail beforehand and then used to test hypotheses. Rather the results of the earlier studies have served as a priori information for the present analysis. The research effort is therefore one of model building. The earlier models can be seen as initial basic models that are empirically and conceptually elaborated in this study (Bielby & Hauser, 1977).

1.1 A brief review of teacher stress

The prevalence, causes and effects of teacher stress have been reported in several studies (for reviews, see Kyriacou & Sutcliffe, 1977a; Kyriacou, 1980). From English studies it has been concluded that the proportion of teachers in comprehensive schools experiencing a great deal of occupational stress is somewhere between a fifth and a third (Kyriacou & Sutcliffe, 1977b, 1978b, 1979; see also Dunham, 1976). In a Swedish study it was found that among white-collar occupational groups, teachers are the most exposed to job-related stress (Wahlund & Nerell, 1976). Numerous causes of teacher stress have been reported. In a factor analytic study, Kyriacou and Sutcliffe (1978b) found four factors of stress sources: (1) pupil misbehaviour, (2) poor working conditions, (3) time pressures, and (4) poor school ethos. In another study, Cox et al. (1978) identified five factors connected with job dissatisfaction: (1) school organization, (2) job demands, (3) teaching resources and job environment, (4) career and training, and (5) pupil behaviour. These results are from English comprehensive schools. In a recent study on Minnesota public school teachers, Needle et al. (1981) concluded that certain job stressors such as the challenge of the task, resource adequacy and financial rewards are shared with other occupations, whereas some stressors are unique to teaching (success with students, overcrowded classrooms, reorganization of classes and the implementing of curriculum goals).In the Swedish study, the most frequently stated causes of stress were class size, incompatible and excessive demands on teachers, and frequent school reforms (Wahlund & Nerell, ibid.).

Widely attributed effects of teacher stress are frustration and anxiety

(Dunham, ibid.), emotional exhaustion (Hargreaves, 1978), job dissatisfaction, absenteeism, and intention to leave the profession (Simpson, 1976; Kyriacou & Sutcliffe, 1979a). Psycho-somatically conditioned illnesses such as headaches, stomach upsets, high blood pressure, and heart troubles have also been reported (Dunham, ibid.; Needle et al. ibid.).

1.2 The conceptual model

A conceptual model of teacher stress is presented in figure 1.

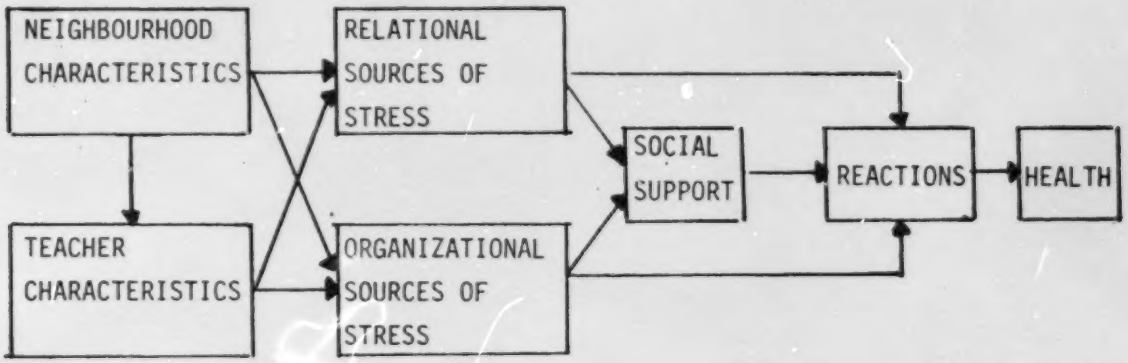

Figure 1. A conceptual model of teacher stress

Two kinds of background variables are envisioned: neighbourhood and teacher characteristics. Through the former it is assumed that the social context of the school influences the frequency of stressors within it. It is important to notice, however, that the neighbourhood characteristics are not primarily incorporated into the model for the purpose of discovering possible "contextual effects" (Burstein & Smith, 1977). The measures are, in the first place, substitutes for the pupils' family background, variables that were not available in the data set. The teacher characteristics are possibly associated with the neighbourhood characteristics. For example, older teachers with long teaching experience can seek employment in schools in areas with a higher socio-economic status.

Both kinds of background variables are supposed to influence the frequency of stressors. The influence from teacher characteristics to the stressors is not unproblematic, however. For some of the characteristics, such as

sex and age, it is quite reasonable to assume that they actually influence the frequency of exposure to stressors; older and male teachers, for instance, tending to work in the higher grades whereas younger and female teachers predominantly work in the lower ones. With respect to other individual characteristics such as those connected with the individual's personality and value system, the causal links have to be understood as a matter of the individuals' susceptibility to the stressors rather than their degree of exposure to them.

The stressors, or sources of stress, are subdivided into two broad categories: relational and organizational sources of stress. The large number of possible sources of stress makes it desirable to subdivide them in some way, and since the teaching profession is rich in human relations content it was deemed fruitful to make a distinction between that aspect of the profession and the organizational ones.

It is assumed that social support has the potentiality to serve as a coping mechanism. As such it can possibly mitigate the effects of the stressors on stress reactions and health. Two kinds of stress reactions are primarily thought of: work dissatisfaction and overload. These reactions, in their turn, are supposed to influence the health of the teachers.

As such the conceptual model is fairly simple and straightforward. It bears resemblance to Kyriacou and Sutcliffes' model of teacher stress but deviates from it in some important aspects (Kyriacou & Sutcliffe, 1978a). In this latter model a distinction is made between potential and actual stressors; a potential stressor (objective aspects of a teacher's job) becoming an actual one only after an evaluation (appraisal) by the teacher as to whether the objective situation constitutes a threat to his self-esteem and well-being or not. This perspective is akin to the central idea in French's job stress model (French et al, 1974) in which strains and illnesses are seen as results of a misfit in a subjective person-environment relation. However, it is not sought in this study to uphold the distinction between objective aspects of the work situation and the subjective appraisals and perceptions of them. The reasons for this are primarily empirical. The more trivial reason is that the data set did not contain equivalent pairs of objective and perceived stressors. More importantly, previous analyses had shown that

in a structural equation model the two kinds of stressors tend to connect so strongly that there is an obvious risk of multicollinearity between the variables (Tellenback et al, 1982). This property of an empirical model possibly creates bias in the estimated parameters. It is therefore suggested that the relation between objective stressors and subjective perceptions of them is studied with data primarily designed for this purpose. That the distinction is regarded as important has already been hinted at. Unfortunately, it has to remain an ambiguity of this study since it is impossible to distinguish between the frequency of occurence of the stressors and the individual's susceptibility to them.

Another implicit assumption of the model is that there exist various coping mechanisms that can mitigate the effects of the stressors. It is also assumed that non occupational stressors can influence the outcome of the job related stress process (see Kyriacou & Sutcliffe, ibid.); there were, however, no indicators in the data set to cover these important aspects. Social support, as one kind of coping mechanism, is incorporated into the model, however, and in this respect the presented model resembles French's model. The latter as well as Kyriacou and Sutcliffes' model have inspired the conceptual framework of this study, but the limitations of the data set itself have necessitated a somewhat simplified model version.

2 DATA AND METHODS

2.1 Population

A questionnaire was distributed to all comprehensive school teachers in Malmö. In the study previously referred to (Tellenback et al., 1982) only a part of the material was coded and analyzed. This study, however, is based on all the collected material. It is therefore a fully constituted study of Malmö school teachers. The Malmö teachers are possibly representative for Swedish school teachers in general, but it has to be remembered that Malmö is one of the Metropolitan regions in Sweden and as such probably characterized by more aggravated school problems than medium-sized and small towns (cf. Tellenback et al., 1981). It is not claimed therefore, that the results of this study are valid for all Swedish comprehensive school teachers.

The questionnaire was sent by post to 1 944 teachers and returned by 1 466; the response rate thus being 75.4%, but multivariate techniques, which require listwise deletion of missing data, were the main tools of analysis, and therefore there was an additional very large internal non-response, i.e. information missing on single items. After the deletion of internal non-response, only 599 cases remained, representing a response rate of 30.8% of the total population (40.9% of the 1 466 cases which remained after the external non-response). This is a consequence of the method used and the very large number of items involved in the analysis. Consequently thorough checks on internal non-respone were made. The respondents' total number of items with missing information was calculated and this new variable was then correlated with all available individual background factors as well as with all other variables included in the model. This analysis showed that only age was significantly related to the rate of internal non-response; elderly teachers having a higher non-response rate on single items (r=.112).

2.2 Variables

In the earlier studies (see Tellenback et al., 1982) the Malmö data were used to replicate the items and factors of a National study. In the present study, however, the data exploration was carried out on a renewed basis although the experience from the earlier analyses guided the effort a great deal. It was decided to make use of as much information in the data set as possible, and the analysis therefore started with an inspection of the correlation matrices. First the health items were correlated with all other variables in the data set, then the procedure was repeated for the stress reaction items, and so on until all aspects of the conceptual model had been covered. The correlational analysis therefore started off with the endogeneous items and then proceeded backwards through the conceptual model, thus covering all relevant associations in the data set.

The correlational analysis resulted in a very large number of interrelated items. Therefore exploratory factor analysis was used as a variable reduction method in the next step of analysis. Items with a similar content, e.g. pupil related items, were put together to form scales and these scales were subjected to a principal component analysis with oblique rotation (Kaiser normalization). Oblique rotation was purposely used because it was hoped that some of the extracted factors could be further reduced to higher-order

factors or higher-order theoretical constructs. The results of the principal component analysis, together with the correlations between factors, are shown in Appendix 1. Because of the number of factors involved and the relatively large numer of items that comprise most of the factors, they are not reproduced in their entirety. Instead the first three items in each factor, together with their loadings, are presented in the Appendix. This sample of items should provide some sense of the character and quality of the data. All items in the study are questionnaire items (with one exception - see below). It is therefore a tacit assumption of the study that the respondents have been able to provide valid reports on, for instance, their health. Most of the items have five response categories with conventional labellings (such as "always", "often", "sometimes", "rarely", and "never"). Some of the items have only three of four response categories, however (see table 1 for a complete presentation).

The items were analyzed in eight dimensions. They were (I) teacher values and needs, (II) pupils as a source of stress, (III) staff and parents as a source of stress, (IV) lack of influence as a source of stress, (V) miscellaneous sources of stress, (VI) social support, (VII) reactions to the sources of stress, and (VIII) health.
Most of the factors delineated through the analysis are rather self-evident in content, but a few remarks will be made about them. As already mentioned, one of the aims of this study has been to discover possible antecedents to the stressors. Since individual biographical variables were known to be unassociated with the stressors, items were sought that in some way could tap the value system of the teachers. All such items, which were correlated to all or several of the stressor items, were put together to form a scale called teacher values and needs. The ensuing factor analysis revealed three different factors in the scale. The first one is referred to as education in human matters. It contains items measuring whether the teacher feels he has enough education in dealing with human problems and human relations (see Appendix 1). The second factor measures the value the teacher puts on participation as a way of improving the working situation of teachers. Finally, the third factor contains items that are supposed to tap the teacher's desire to uphold a social distance in human relations. The conceptual status of these factors will be discussed at greater length in the Discussion section.

The pupil related items formed four factors: pupils' motivation, pupils' negligence, pupils' lack of discipline, and pupil dissimilarity. Note that

all the items were coded in such a way that high values imply the negative aspect of the beaviour. Each of the staff categories and the parents formed seperate factors. 'Pupils care personnel' refers to school nurses, psychologists, and welfare officers. 'Other personnel' refers to porters and refectory personnel. The 'lack of influence' factors pertain to a lack of influence over organizational issues, over teaching methods, and over some miscellaneous issues such as the physical environment of the school.

The remaining stressor items were put together to form a common scale called 'miscellaneous sources of stress'. It contained four factors: lack of personal facilities, time pressure, lack of classroom facilities, and noi e. The social support items covered three factors, namely support from the central school agencies, from the union, and from the staff. Thus, social support pertains only to support from work related social groups. Unfortunately, there were no items covering social support from family and friends.

The items measuring reactions to the sources of stress were taken from the Job Descriptive Index (Smith & Kendall, 1969). The first factor measures if work is conceived as stimulating and interesting. Therefore the factor could be interpreted as an aspect of work satisfaction. The two other factors of the scale measure whether work is trying and fatiguing and whether it is unhealthy and dangerous. These factors are therefore seen as manifestations of work related overload. The health scale also contained three factors. They were mental disorders, medical treatment, and psychosomatic symptoms respectively. In the Appendix the factors are presented in order so that the first extracted factor comes first, then the second extracted factor and so on. Most of the factors had an eigenvalue of at least one. The amount of the total variance accounted for by the first extracted factor in the unrotated solution ranged from 23.7% (LOIORGAN) to 43.9% (MENTDISO).

Apart from the questionnaire items there were measures of the socio-economic status of the school's neighbourhood. The variables were recorded from the city's official statistics. These variables were also subjected to a principal component analysis. The results are shown in Appendix 2. The first extracted factor is called the social status of the neighbourhood and the variables with the strongest loadings are the percentage of immigrants in the area, the percentage of people on social welfare, and the percentage of public housing (number of apartment units publicly owned in relation to the total number of apartment units). The second factor, referred to as the economic status of the neighbourhood, contains the

following variables: percentage of large apartments (more than five rooms plus kitchen), percentage of villas, and percentage of people with a large income.

As already mentioned, these measures were not brought into the analysis for the purpose of discovering "contextual effects". The most appropriate unit of analysis for the indicators would have been the classroom, i.e. an average measure built on the pupils' individual family background. There were no such data, however. Through the measures employed here it is assumed that teachers that work in "difficult" areas also have difficult pupils. Since the measures apply to the school level (the school's catchment area) they can only affect the other variables through the between-school component. The within-school variation between the teachers is not reflected (Hauser, 1969).

2.3 Index construction

Indices were constructed on the basis of the results of the principal component analysis. Consideration was given to building indices by using the component scores but this was refrained from. The factor analysis was primarily used as a variable reduction method and the specific values obtained in the factor solutions were not taken at their face value. Instead the more conservative stance was taken, namely, to view the structure found by the factor analysis as only suggestive, indicating some clustering in the data (Kim & Mueller, 1978).

The following procedure was followed in building the indices. First the items with substantial loadings (larger than .40) were selected. These items were then tested for reliability by Cronbach's alpha. If the reliability of the scale could be improved by deleting one or several items this was done. Finally, the indices were constructed by simply adding the item values and dividing the score by the number of items; thus giving the scale the same range as that of the original items. The indices constructed in this way will be used as new variables in the subsequent analysis. They are presented in table 1 together with variable labels, number of items in the scale, the range, and by Cronbach's alpha (means and standard deviations are presented together with the LISREL input correlation matrix in Appendix 4).

Table 1. Variable labels, number of items, min/max, and Cronbach's alpha of composite indices (model variables). Means and standard deviations presented in Appendix 4 . N = 599.

Variable/index	Variable label	Box in conceptual model	No of items	Min-max	Cronbach's alpha
1. Social status	SOCISTAT	Neighbourhood characteristics	4	0-100	.743
2. Economic status	ECONSTAT	"-"	3	0-100	.653
3. Age	AGE	Teacher characteristics	1	1-5	-
4. Education in human matters	HUMEDUC	"-"	7	1-4	.899
5. Participatory values	PARTIVAL	"-"	8	1-3	.838
6. Seclusive values	SECLUVAL	"-"	6	1-5	.778
7. Pupils' motivation	PUPMOTIV	Relational sources of stress	7	1-5	.884
8. Pupils' negligence	PUPNEGLI	"-"	3	1-5	.844
9. Pupils' lack of discipline	PUPDISCI	"-"	2	1-5	.905
10. Pupil dissimilarity	PUPDISSI	"-"	2	1-3	.727
11. Relations to colleagues	RELCOLLE	"-"	5	1-5	.809
12. Relations to management	RELMANAG	"-"	6	1-5	.921
13. Relations to pupils care personnel	RELCAPPE	"-"	7	1-5	.850
14. Relations to parents	RELPAREN	"-"	7	1-5	.726
15. Relations to other personnel	RELOTHPE	"-"	5	1-5	.794
16. Lack of influence over organizational issues	LOIORGAN	Organizational sources of stress	7	1-5	.792
17. Lack of influence over teaching methods	LOITEACH	"-"	4	1-5	.724
18. Lack of influence over miscellaneous issues	LOIMISCE	"-"	4	1-5	.807
19. Lack of personal facilities	LOPEFACI	"-"	7	1-4	.770
20. Time pressure	TIMEPRES	"-"	2	1-5	.801

Table 1

Variable/index	Variable label	Box in conceptual model	No of items	Min-max	Cronbach's alpha
21. Lack of classroom facilities	LOCLFACI	Organizational sources of stress	6	1-5	.772
22. Noise	NOISE	"-"	3	1-3	.672
23. Support from central school agencies	CENTSUPP	Social support	8	1-5	.850
24. Support from the union	UNIOSUPP	"-"	6	1-5	.887
25. Support from the school staff	STAFSUPP	"-"	4	1-5	.758
26. Work is stimulating and interesting	WORKSTIM	Reactions	5	1-3	.863
27. Work is trying and fatiguing	WORKTRYI	"-"	4	1-3	.661
28. Work is unhealthy and dangerous	WORKUNHE	"-"	2	1-3	.614
29. Mental disorders	MENTDISO	Health	5	1-5	.858
30. Medical treatment	MEDTREAT	"-"	3	1-5	.689
31. Psycho-somatic symptoms	PSSOSYMP	"-"	3	1-5	.687
		Total number of items	146		

In table 1 it also indicated where the variables belong in the conceptual model. SOCISTAT and ECONSTAT are neighbourhood characteristics whereas HUMEDUC, PARTIVAL and SECLUVAL are teacher characteristics. The pupil related variables and the variables measuring relations to staff and parents all belong to the relational sources of stress. The lack of influence variables together with LOPEFACI, TIMEPRES, LOCLFACI and NOISE are seen as organizational sources of stress. The social support variables naturally belong to the social support box. WORKSTIM, WORKTRYI and WORKUNHE are reactions to the sources of stress and MENTDISO, MEDTREAT and PSSOSYMP are health variables.

The variables are coded in the following way. SOCISTAT and ECONSTAT have high values for high status neighbourhoods and low values for low status ones. High values on HUMEDUC means that the respondent feels he has enough education in human matters. High values on PARTIVAL and SECLUVAL imply that the respondent encompasses those values. All the sources of stress are coded so that high values mean the negative aspect of the phenomenon, e.g. a lack of pupils' motivation or poor relations. High values on social support, on the other hand, imply the positive aspect, i.e. the respondent feels he gets a lot of social support. WORKSTIM is coded so that the respondent has a high value if he thinks that his work is stimulating. High values on WORKTRYI and WORKUNHE mean that work is conceived as trying and unhealthy respectively. The health variables, finally, have high values for a lot of symptoms, a lot of medical treatment and so on.

2.4. Higher-order theoretical constructs

One option in the analysis would have been to use the original items as manifest input variables in the structural equation model. They would then have been measures of common factors (latent variables) in the method to be used (LISREL). One of the objectives of the study, however, was to make the empirical model as parsimonious as possible. A different analytical strategy was therefore adopted.

An inspection of the correlations between the factors obtained in the principal component analysis suggests that there may be a higher-order factorial causation between some of the factors (see Appendix 1). The correlations between the pupil related factors, for instance, are rather

high. The same is true of the health related factors. It was therefore decided to repeat the exploratory factor analysis on the level of the newly constructed variables. It is important to notice that this analysis was made for the sole purpose of giving guidance to the specification of the structural equation model. It was hoped that the analysis would reveal an opportunity to treat some of the variables in table 1 as manifest variables measuring common underlying theoretical constructs. This pragmatic approach implies that the usefulness of the adopted analytical strategy would first find confirmation in the LISREL measurement model, and that no specific theoretical importance is attached to the factor solutions as such.

The factor analyses were made to conform to the assumptions of the conceptual model; all variables belonging to a particular box in the model being analyzed simultaneously. The results are presented in Appendix 3. Most of the results are straightforward and easy to interpret. The relational sources of stress form two factors, one made up of the pupil related variables and the other by the staff and parents related ones. The organizational sources of stress likewise contain two factors. One of them is made up of lack of facilities, noise and time pressure. The other one contains the lack of influence variables. The other boxes of the conceptual model contained very few variables and therefore factor analyzing these small sets of variables was less meaningful. It was done, nevertheless, in order to make the analysis complete. With the exception of the teacher characteristic variables just one factor for each scale was extracted in these additional analyses. Note that, as a consequence, there was no rotation of these factors.

The results suggested that it would be possible to treat several of the variables as manifest variables measuring underlying theoretical constructs. In each case, however, the analysis was based on a small number of variables. The results of the analysis were therefore taken for granted only in the rather self-evident and easily interpretable cases (pupils, staff and parents, and lack of influence as a source of stress, social support, and health were regarded as such unproblematic cases). Since, however, the present research effort is one of model building the desire was to base the final model specification on as unambiguous assumptions as possible. The factor solutions causing some doubt with regard to the model specifi-

cation were those pertaining to teacher characteristics, physical environment as a source of stress, and reactions to the sources of stress. The results indicated that HUMEDUC and PARTIVAL could be seen as measures of a common underlying cause but the eigenvalue of the factor was quite small (.534). It was also difficult to give a meaningful theoretical interpretation to the factor (although interpreting HUMEDUC as a wish for more human education would make some sense as a phenomenon close to a wish for more participation). Another ambiguity resided in the first factor of organizational sources of stress. The fourth variable in the factor, time pressure, had a low factor loading and also a very low communality (.128). The first three variables in the factor also make sense as manifestations of a common underlying cause which can be interpreted as the physical environment as a source of strain. Time pressure, on the other hand, can hardly be seen as an aspect of the physical environment. The last factor causing some doubt was reactions to the stress sources. In this case the three variables, WORKSTIM, WORKTRYI and WORKUNHE, all had reasonable factor loadings and communalities, but it could be conceptually argued that WORKSTIM should be treated as a separate measure of work satisfaction whereas WORKTRYI and WORKUNHE could be see as measures of work overload.

Before proceeding with the structural equation model it was necessary to decide whether a common higher-order underlying factor could be assumed in each of the three cases previously discussed. Since the main cause of the difficulties of interpretation was the small number of variables in the factor solutions it was decided to carry out a confirmatory factor analysis with LISREL in which the larger number of original items were used as input. In addition, the confirmatory factor analysis made it possible to directly study the assumptions of a higher-order factorial model. The method cannot be discussed extensively here (see Jöreskog & Sörbom, 1978, 1979; for an application, see Bynner, 1981), but a few details of the analyses will be given. In the reactions scale, for instance, correlations of the original items were used as input to the program. The lower-orders factors (corresponding to WORKSTIM, WORKTRYI and WORKUNHE) were specified to be measured by three different sets of items (the same as those referenced in table 1; see also Appendix 1). The three lower-order factors were therefore measured by eleven input observables. In addition, a higher-order factor was specified as causing the three lower-order ones; the whole specification scheme thus representing a higher-order factorial model. The solution gave a reasonable fit to the data (chi-square equal to 168 with 41 degrees of freedom; n=599). The paths from the common higher-order factor to WORKSTIM, WORKTRYI and WORKUNHE had the values of -.44, .45 and .72 respectively.

The results were therefore in agreement with those of the exploratory factor analysis.

The two other scales also gave reasonable solutions for a higher-order factorial model. Before deciding on the issue, however, all the newly created scales were tested for reliability by Cronbach's alpha. HUMEDUC and PARTIVAL yielded an alpha of .377 which is a very low reliability even taking into consideration the fact that just two variables formed the scale. The scale containing time pressure had an alpha of .655 and the reactions scale's value was .630. Considering the small number of variables in the scales these reliabilities are acceptable.

On the basis of the material presented in this section the following was finally decided about the three scales causing uncertainty. HUMEDUC and PARTIVAL would subsequently be treated as separate variables because of the low common reliability. Because of the reasonable solution to the confirmatory factor analysis and because of the relatively high reliability of the scale, the three reactions variables would be treated as manifestations of a common underlying cause. The scale containing time pressure likewise behaved in an orderly manner under a confirmatory factor analysis and under a reliability analysis. In this case, however, it was decided to treat time pressure as a separate variable. The reason for this was primarily conceptual. It has already been mentioned that it is difficult to interpret the variable as an expression of the physical environment and it was therefore judged that conceptual clarity would be gained by treating it separately. In addition, time pressure is a source of stress that is frequently mentioned in the literature, and it was wished to study its effects as a distinct variable.

The rather comprehensive analyses presented so far reduced the initially very large number of items considerably. From the items studied in the correlational analyses, 145 were extracted through the first exploratory factor analysis. This number was reduced further by constructing 30 new variables (composite indices). With age as a separate single item variable this resulted in 31 variables which could be included in a structural equation model. Through the last exploratory factor analysis (with a supplementary confirmatory factor analysis) it was shown that many of the 31 variables can probably be specified as input manifest variables measuring underlying theoretical constructs (latent variables) in the structural equation model; thus reducing the number of theoretical (latent) variables still further.

The reliabilities of the latent variables are shown in table 2.

Table 2. Variable labels, number of manifest variables, and Cronbach's alpha of latent variables.

Latent variables	Variable label	Box in conceptual model	Number of manifest variables	Cronbach's alpha
1. Socio-economic status of the neighbourhood	NEIGHBOU	Neighbourhood characteristics	2	.541
2. Age	AGE	Teacher characteristics	1	-
3. Education in human matters	HUMEDUC	" "	1	-
4. Participatory values	PARTIVAL	" "	1	-
5. Seclusive values	SECLUVAL	" "	1	-
6. Pupils as a source of stress	PUPILS	Relational sources of stress	4	.754
7. Staff and parents as a source of stress	STAFF/PA	" " " "	5	.637
8. Lack of influence as a source of stress	LOINFLUE	Organizational sources of stress	3	.655
9. Time pressure	TIMEPRES	" " " "	1	-
10. Physical environment as a source of stress	PHYSENVI	" " " "	3	.683
11. Social support	SOCISUPP	Social support	3	.615
12. Reactions to the sources of stress	REACTION	Reactions	3	.630
13. Health	HEALTH	Health	3	.726
		Total number of manifest variables	31	

NEIGHBOU, PUPILS, STAFF/PA, LOINFLUE, PHYSENVI, SOCISUPP, REACTION and HEALTH are new latent variables, created on the basis of the last round of factor analyses (the sets of manifest variables are presented in Appendix 3). The reliabilities of the new scales are all aceptable considering the small number of variables in each scale. AGE, HUMEDUC, PARTIVAL, SECLUVAL and TIMEPRES are the same variables as in table 1.

2.5. Model specification

The interrelatedness of the latent variables was analyzed with a full-information maximum likelihood program, LISREL IV (Jöreskog, 1973; Jöreskog & Sörbom, 1978). The variables presented in table 1 were used as input variables. Since they are composite indices of several items they each contain more than the five (four and three respectively) values of the original item scales. The measurement properties of the variables must therefore be deemed to be adequate for the method, which theoretically requires interval scale measurement (3-, 4-, or 5-point ordinal scales are frequently analyzed, however; see Munck, 1979, for a discussion). Another requirement of the method is that the input variables are multinormally distributed. If one or several of the input variables are very skewed this is an indication that the normality assumptions have, perhaps, been violated. For this reason the most skewed among the input variables were recoded to a 3-point ordinal scale thereby creating flatter distributions of these variables (see Appendix 4). After this procedure all input variables had a skewness between -.50 and .50. MEDTREAT, however, remained quite skewed even after the recoding procedure and was therefore omitted from the LISREL analysis.

A LISREL model consists of two parts. In a measurement model the relations between manifest and latent variables are specified, and there is also a structural model which represents the causal network between the latent variables. In the LISREL measurement model each latent variable was measured by the manifest variables depicted in Appendix 3 and table 2. Some of the variables (AGE, HUMEDUC, PARTIVAL, SECLUVAL, and TIMEPRES) were measured by just one variable, however. In a LISREL model, such variables are conceived as latent variables with just one input manifest variable. At this point a remark ought to be made about the measurement status of the latent variables of the model. If the linear combinations of the observed items, i.e. the input manifest variables, are considered

as factors then the latent variables measured by several manifest ones could be regarded as higher-order factors. This is a controversial assumption, however (see Bentler, 1980). Therefore the concept 'higher-order factor' has been avoided except in the presentation of the confirmatory factor analysis where it is unequivocally appropriate. Instead, the more universal concept 'higher-order theoretical construct' has been employed. It can also be mentioned that there exist extensions of the LISREL approach to designs that allow for multiple levels of latent variables simultaneously incorporated into a structural relations system (Bentler & Weeks, 1979; 1980). In this approach it is possible to assume unidirectional causal influences between the higher-order factors. Applied to the present problem, however, these methods would result in extremely complex models and rather staggering computational costs. Instead composite indices were used as a practical expedient thereby allowing for simpler model designs. Another possibility would have been to use the original items as input manifest variables not bothering about the dimensionality in the various scales. This, however, would also have resulted in a more complex design. By using the present method correlations (or covariances) between 31 instead of 146 manifest variables could be used as input to the LISREL program. In addition, the dimensions represented by the input variables all have a clear and interpretable content. It is claimed therefore that the analytical strategy adopted has resulted not only in a parsimonious design but also in a conceptually clear measurement model.

The LISREL structural model was specified in the following way. NEIGHBOU, AGE, HUMEDUC, PARTIVAL and SECLUVAL were all specified to be exogeneous latent variables, whereas PUPILS, STAFF/PA, LOINFLUE, TIMEPRES, PHYSENVI, SOCISUPP, REACTION and HEALTH were endogeneous latent variables. In the initial runs the model was constrained to be recursive. In subsequent runs, various feedback relations were tested. Apart from the mentioned constraints, the model was analyzed in an explorative fashion. The following procedure was used. Parameters with estimates which were small in comparison to their standard errors (T-values in the LISREL terminology) were eliminated from the model and the resulting model re-estimated. Parameters were also added to the model, however. Sörbom (1975) has suggested that it is possible to study the first order derivatives of the fit function to obtain some guidance in respecifying the model. If these derivatives are large for certain missing parameters it is possible that the inclusion of the latter in the model may improve the fit. Consequently,

the modelling procedure was based on a gradual removal of parameters with small T-values and a gradual inclusion of parameters with large first order derivatives. This process went on until it was not possible to improve the fit of the model any further (i.e. given the basic constraints of the model described earlier). It should be recognized that this procedure can capitalize on chance associations in the data. Results from this study should not be taken at their face value therefore, but ought to be replicated in hypotheses testing designs.

The LISREL input correlation matrix together with means and standard deviations is presented in Appendix 4. The large number of schools (65) and the small number of teachers within each school made it unnecessary to control for possible school effects. For this reason the pooled within-group moment matrix was not computed to be used as input to the program.

3 RESULTS

The LISREL measurement model (not presented) yielded quite acceptable values for the measurement relations (lambda y's in the LISREL terminology). In the standardized solution, the highest value of lambda y was .789 (PUPMOTIV) and the lowest .457 (LOITEACH). There were two other values below .50 (.459 for RELMANAG and -.473 for WORKSTIM).

The LISREL structural model is presented in figure 2. Since the scaling properties of the variables differ the standardized solution is presented. Chi-square for 380 degrees of freedom is 1112. For n equal to 599 this is a reasonable fit; the chi-square statistic being dependent on the number of cases. Only significant paths (T-values larger than 2) are included in the figure.

The double-headed arrows between the exogeneous latent variables designate correlations. The single-headed arrows signify unidirectional causal influences from the exogeneous variables to the endogeneous variables and also causal paths between the latter. As can be seen from the figure, there are rather strong associations between the exogeneous variables AGE, HUMEDUC and PARTIVAL; AGE being positively correlated to HUMEDUC and negatively to PARTIVAL. There is also a negative association between HUMEDUC and PARTIVAL. Elderly teachers, therefore, tend to think that they have received enough education in human matters and they attach less importance

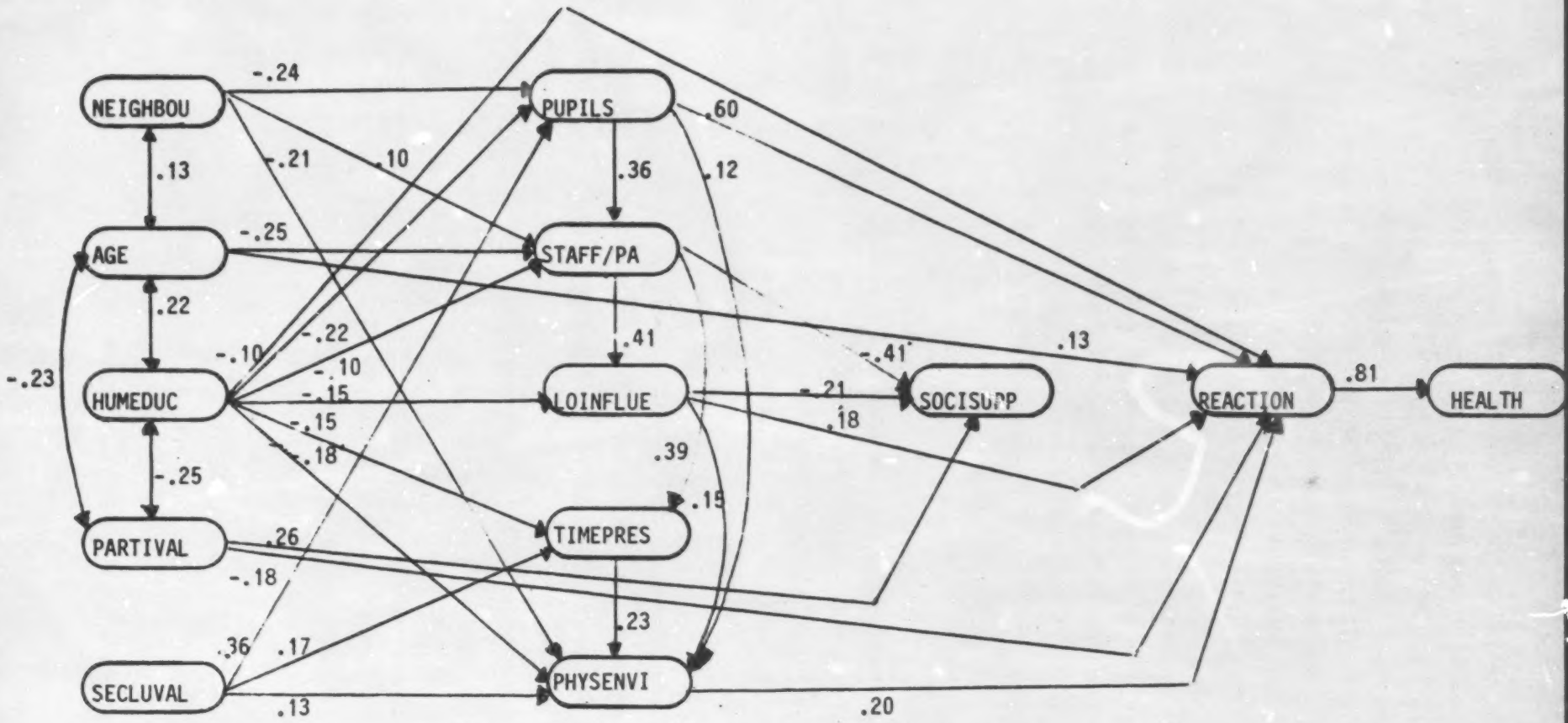

Figure 2. LISREL-solution for a model of teacher stress. Only structural model represented. Standardized parameter estimates. All path coefficients significant.
LISREL fit statistics: Chi^2=1112; df=380; n=599.

to participation as a way of improving the working situation.

All the exogeneous variables except PARTIVAL influence the sources of stress. NEIGHBOU has a substantial influence on PUPILS and PHYSENVI. The negative signs imply that in neighbourhoods with a higher socio-economic status there is less trouble with pupils and a more favourable physical work environment. AGE connects negatively with STAFF/PA which means that older teachers have better relations with school personnel and the parents. HUMEDUC has significant paths to all the sources of stress. The more the respondent feels he has sufficient education in human matters the less he is exposed,or susceptible, to the stressors. There are no connections from PARTIVAL to the stressors whereas SECLUVAL rather strongly influences PUPILS. This means that respondents who express a desire for seclusion or social distance in their human relations also experience the pupils as more troublesome.

There are also strong associations between the stressor variables. PUPILS influences STAFF/PA undirectionally. At this point it would be natural to assume a feedback relation between the variables but this assumption slightly impaired the fit of the model. The feedback relation was therefore left out in the presented solution. STAFF/PA connects strongly to both LOINFLUE and TIMEPRES, and there is also a rather strong association between TIMEPRES and PHYSENVI.

SOCISUPP is explained by STAFF/PA, PARTIVAL and LOINFLUE in that order. The solution indicates that teachers who have poor relations with the school personnel and parents and who lack influence also receive less social support. Teachers with participatory values, on the other hand, receive more social support. Note that there are no paths from PARTIVAL to STAFF/PA and LOINFLUE. This is an indication that social support is formed by two distinct processes. In one of them older teachers receive their social support through the mediation of better relations to staff and parents and through greater influence. In the other process younger teachers with participatory values get social support directly or through the mediation of variables not included in the model.

A rather striking feature of the solution is that SOCISUPP is well explained within the model whereas the variable does not contribute to explaining REACTION and HEALTH. In a solution where SOCISUPP was constrained to

influence these two variables the resulting path coefficients were quite low (about .010) and far from being significant. The conclusion therefore must be that social support is quite ineffective as a buffering mechanism between the sources of stress and the reactions (including health) to them. It has to be remembered, however, that only social support from work related social groups was included in the analysis.

The antecedents of REACTION are PUPILS, PHYSENVI, AGE, PARTIVAL, LOINFLUE, and HUMEDUC (in order of importance). PUPILS is by far the most important antecedent and there is also a rather strong connection from PHYSENVI. The path from REACTION to HEALTH, finally is the strongest one in the solution. Several feedback links were tested in the analysis but none improved the fit of the model.

The explained variance of the latent dependent variables is shown in table 3.

Table 3. Explained variance of latent dependent variables. Standardized solution.

Latent variables	Explained variance	Latent variables	Explained variance
PUPILS	.232	PHYSENVI	.301
STAFF/PA	.224	SOCISUPP	.328
LOINFLUE	.220	REACTION	.638
TIMEPRES	.241	HEALTH	.684

The sources of stress have the lowest explained variance in the model, ranging from .220 (LOINFLUE) to .301 (PHYSENVI). The figure for SOCISUPP is .328 and for REACTION and HEALTH the explained variances are .638 and .684 respectively. The amount of explained variance for the two latter variables is unusually high for analyses based on survey data. The high figures are basically dependent on two very strong path coefficients in the solution: from PUPILS to REACTION (.60) and from REACTION to HEALTH (.81). Path coefficients of this magnitude can serve as warning signals of possible misspecifications of the model; empirical phenomena too similar in content to be treated as separate entities being associated to a rather extreme degree. In this case, however, the latent variables involved all measure conceptually very distinct phenomena. But, on the other hand, the solution indicates that REACTION and HEALTH are both aspects of a larger

syndrome of response to the sources of stress.

As has been previosly mentioned only 599 cases, representing a response rate of 30.8 %, were part of this analysis. This was a consequence of the method, which requires a listwise deletion of missing observations. When a large number of items is analyzed this procedure leads to a drastic increase in the rate of internal non-response. In order to check if the large internal non-response had biased the results the LISREL model was reanalyzed on a partly new basis. This time all respondents who had answered half or more than half of the items in each scale (i.e. in the indices used as input variables) were included in the analysis. This procedure reduces the non-response but, on the other hand, is also implies that the measurement model varies for different individuals. After having used this method of handling the non-response, 1 123 cases remained for the LISREL analysis. This represents a response rate of 57.8 % of the total population. The number of cases included in the analysis was therefore almost doubled. The LISREL solution based on this increased number of respondents (not presented) was almost identical to the previous one; the largest deviation in the values of the path coefficients being .06. This result indicates that the parameter estimates presented in figure 2 and table 3 have not been seriously biased by the large non-response.

Sex was not included as a background variable in the structural equation model. Instead the analysis was repeated for male and female teachers separately (solutions not presented). There were very small differences between the common solution and the ones for the sex groups. The model therefore seems to be valid irrespective of sex. In the subgroups, with a smaller number of observations, the fit of the model improved markedly. In the male teacher group with n equal to 189, chi-square with 377 degrees of freedom was 615. Under the assumption of correlated measurement errors the solution for the male group had a significant fit to the data.

4 DISCUSSION

A large number of items was gradually reduced to a manageable number of latent variables in a LISREL model specification. In this process correlational, factorial as well as reliability analyses were used. The resulting structural equation model had the virtue of being relatively parsimo-

nious in its design which was one of the objectives of the study. The latent variables of the LISREL model can be interpreted as higher-order theoretical constructs measured by composite indices as input manifest variables. Under the assumption that the composite indices represent lower-order factors, the latent variables of the LISREL model could be interpreted as higher-order factors. In both interpretations it can be concluded, however, that the structural equation model represents the analyzed phenomena at a high level of abstraction.

The LISREL solution presented yields straightforward and easily interpretable results. Alternative model specifications can be considered at a few points, however. The first point concerns the status of the teacher characteristic variables as exogeneous variables. It could be argued that HUMEDUC, PARTIVAL and SECLUVAL are results of the sources of stress rather than antecedents to them. There were two reasons, however, for treating these individual characteristics as exogeneous variables. The first reason was strictly empirical. In the initial runs model specifications were evaluated in which the mentioned variables were constrained to be endogeneous. In these solutions, however, there were many paths leading from the variables but no paths leading to them. It was concluded therefore that HUMEDUC, PARTIVAL and SECLUVAL were exogeneous variables within the context of the actual model.

The second reason concerns the conceptual status of the three variables. So far the variables have been referred to as "teacher values and needs", an expression which indicates that the variables are part of the teachers' value system. Another interpretation could be afforded, however. PARTIVAL and SECLUVAL could be seen as manifestations of extroversion and introversion respectively and as such trait-like personality characteristics. The conceptual status of HUMEDUC is more difficult to interpret. It is quite interesting to note, however, that in the Swedish school system there are no opportunities for teachers to receive further education in human relations. It is therefore unlikely that the teachers actually differ with respect to the amount of such training they have received. It is also interesting to note that HUMEDUC is the most important antecedent variable in the sense that it influences all the sources of stress. The discovery of this variable therefore entailed an element of serendipity in the research process. One possible explanation for the importance of HUMEDUC is that the variable is a manifestation of self-confidence and mastery, i.e.

also a trait-like personality characteristic. Too much importance should not be attached to these interpretations, however. The variables were discovered in a purely explorative research effort and the scales were constructed on an ad hoc basis. The point to be made, however, is that there were empirical reasons for treating HUMEDUC, PARTIVAL and SECLUVAL as exogeneous variables and that it was also possible to interpret these variables as manifestations of background personality factors.

It can also be mentioned that there are a few studies which explicitly address the interconnections between teacher personality traits and teacher stress. Parkay (1980), for example, mentions a Group A type of teachers who prefer to maintain a high social and empathic distance between themselves and the students, and it is concluded by the author that these teachers experience a multidimensional conflict with their work environment. This seems close enough to the SECLUVAL variable of this study, and it can be pointed out that this variable associates positively with three of the stress sources in the LISREL model and most importantly with the pupil related stressor. Parkey (ibid.) also mentions a Group C type which is characterized by strong feelings of effectiveness in the situation and overall job satisfaction. This group possibly corresponds to the teachers that have high values on the HUMEDUC variable, and it should be recalled that there are negative paths from this variable to all the sources of stress and to REACTION. The remaining group in Parkey's typology is Group B teachers characterized by a concern for establishing open, warm and humane relationships with the students. This group could possibly correspond to teachers with high values on PARTIVAL but this time the analogy seems somewhat far-fetched.

As was pointed out in connection with the presentation of the conceptual model, there is an ambiguity in this study insofar as it does not distinguish between potential and actual stressors. That discussion won't be reiterated here. Let it just be mentioned that the individual characteristics just discussed most probably function as intervening variables between pairs of potential and actual stressors. If this assumption is correct, then the sources of stress as presented in the empirical model should, logically speaking, be interpreted as actual stressors, i.e. stressors as they are perceived after an appraisal process by the teachers (see Kyriacou & Sutcliffe, 1978a).

Another problem of model specification concerns the role of social support. In French's conceptual model of job stress (French et al, 1974), there are arrows drawn from the (subjective) social support box to other parts of the model. This implies that social support is treated as an exogeneous variable of the model, empirically speaking. In this study, however, the intention was to interpret the phenomenon as something that develops in the school milieu, i.e. as an endogeneous variable. The reason for adopting this perspective was quite simply that social support was measured as social support from work related social groups. Had the variable involved support from family and friends it would have been more natural to treat it exogeneously since its influence would then stem from outside the school context. Indeed the present discussion suggests that, in empirical applications, various kinds of social support ought to be distinguished, i.e. social support that is exogeneous and endogeneousrespectively in relation to the investigated context. With the adopted model specification there were two possible outcomes. Either teachers that were exposed and susceptible to the stressors would seek and receive increased social support, or it would be teachers that already were well adjusted to the school milieu that also received more support. As can be seen from figure 2 it is the latter interpretation that finds empirical confirmation. This finding suggests that there are "good" and "vicious" circles entailed in the stress process. The buffer mechanisms don't work for teachers that have problems whereas well adjusted teachers also receive additional social support.

One final aspect of the model specification ought to be mentioned. After a rather laborious procedure it was decided to treat WORKSTIM, WORKTRYI and WORKUNHE as measures of a common underlying variable, REACTION. WORKTRYI and WORKUNHE can be interpreted, it has been argued, as aspects of work overload whereas WORKSTIM can be seen as a manifestation of job satisfaction (or rater dissatisfaction in connection with the common latent variable). The analysis therefore indicates that overload and job dissatisfaction are parts of a common syndrome of reactions to work related stressors. This aspect of the model specification was adopted somewhat reluctantly, however, and it has to be emphasized that overload and job (dis)satisfaction could have been treated as two separate variables. From an empirical point of view both ways of proceeding were justified. The criterion for settling the issue was, this time, increased parsimony of the empirical model.

With the above remarks and reservations in mind, the main findings of this study can be summarized as follows. The most important antecedents of the sources of stress are located within the personality and value system of the teachers. In the studies preceding this one (see Tellenback et al, 1982), several biographical characteristics of the teachers were analyzed but none could be shown to be significantly associated with the stressors. Similar results have been reported by Kyriacou and Sutcliffe (1978b). The amount of explained variance in the stressor variables is still relatively low even after the inclusion of the teacher characteristic variables (see table 3), but there is a marked improvement in relation to the previous studies. It is therefore suggested that future research attaches increased importance to personality characteristics as vital aspects of the stress process.

It has been argued, however, that the teacher characteristics ought to be interpreted as antecedents to the actual, rather than the potential, stressors. This perspective implies that there must be another set of antecedents to the potential stressors. In this study, neighbourhood characteristics have been used as substitute variables for the pupils' family background, and there is a rather strong association between NEIGHBOU and PUPILS in the LISREL solution (similar findings are reported by Pratt, 1978). But it is interesting to note that there is also a rather strong connection between NEIGHBOU and PHYSENVI. This finding indicates that the neighbourhood characteristics have exerted an influence not only as substitute variables for family background but also as truly contextual variables. The substantial aspects of the findings are far from surprising but they have important methodological consequences since they imply that both individual variables of family background (possibly used to construct average measures at the classroom level) and contextual variables are needed in order to properly explain the potential stressors. This discussion also implies that the explanation of the potential stressors is primarily a sociological problem whereas the relation between potential and actual stressors is a psychological one. It is therefore rather obvious that the stress process ought to be studied from an interdisciplinary perspective.

The findings concerning the influence of the sources of stress confirm previous research. The importance of pupil misbehaviour as a stress source has been reported in several studies (see for instance, Behrman, 1977; Cox

et al, 1978; Holdaway, 1978; Kyriacou & Sutcliffe, 1978b). Relations to colleagues and parents are not associated with the stress reactions in this study. Fountain (1975), among others, has arrived at a similar conclusion. Grant (1977) has studied the importance of influence over decision-making in school work and he found that this factor contributed to the teachers' job satisfaction. That finding is confirmed by the present study insofar as lack of influence is related to the stress reactions. The effects of time pressure have been investigated by several authors (see Fountain, ibid.; Kyriacou & Sutcliffe, ibid.). In the LISREL solution there was no significant path coefficient from time pressure to the stress reactions. Results from a National study previously reported (see Brenner et al, 1981) showed that a time related stressor was important for Swedish comprehensive school teachers, however. There is no way of telling whether the lack of importance of this stressor in the Malmö data is substantial or merely a result of inadequate measurement. Aspects of the physical environment, finally, have been investigated by Kyriacou & Sutcliffe (ibid.).

The importance of social support as a moderator of stress has been pointed out by several authors (see Dunham, 1980; Kyriacou, 1981). Social support as measured in this study proved to be quite ineffective in alleviating stress reactions, however. The variable belongs to a nexus of relations to colleagues, influence and support which is rather well explained in the model but which, on the other hand, has little or no bearing on the stress reactions.

The importance of stress for health is a recurrent theme in stress research. In this study there was a very strong connection between a syndrome of workload and job dissatisfaction and a latent health variable measured by mental disorders and psycho-somatic symptoms.

The postulate of parsimony in the model building process has been repeatedly argued for in this paper. The structural equation model presented contains thirteen latent variables and yet it is far from being a complete representation of the teacher stress process. In the presentation of the conceptual model it was emphasized that several important aspects of the stress process were lacking. This pertains to non-occupational stressors as well as coping mechanisms other than social support (Pearlin & Schooler, 1978, have empirically demonstrated how complex just the coping mechanisms are). The distinction between potential and actual stressors has been

discussed in several places. The inclusion of both kinds of stressors would increase the complexity of the empirical model substantially. The explanation of the potential stressors would necessitate the inclusion of additional variables. The set of relevant stress sources is probably not complete (in the present data there were no measures of job aspects such as salary, promotion opportunities and occupational status, for instance), and so on. It goes without saying that a research design has to be extremely parsimonious in order to be able to include all these aspects. Nevertheless it is claimed that the present study has shown that it is possible to build structural equation models that are both parsimonious and which make use of all (or nearly all) relevant information available in the data file. The study has also shown, however, that this can only be accomplished by a careful data analysis preceding the structural equation analysis itself. The concept 'model building' is therefore very appropriate because it emphasizes the step-by-step construction of a workable representation of the causal processes.

APPENDIX 1

A PARTIAL LISTING OF FACTOR ITEMS MEASURING (I) TEACHER VALUES AND NEEDS, (II) PUPILS AS A SOURCE OF STRESS, (III) STAFF AND PARENTS AS A SOURCE OF STRESS, (IV) LACK OF INFLUENCE AS A SOURCE OF STRESS, (V) MISCELLANEOUS SOURCES OF STRESS, (VI) SOCIAL SUPPORT, (VII) REACTIONS TO THE SOURCES OF STRESS, AND (VIII) HEALTH (Principal component analysis with oblique rotation; item loadings shown in parentheses; all items recoded to have a common sign within the factors).

I TEACHER VALUES AND NEEDS

A. Education in human matters (HUMEDUC). Did you have sufficient education in?: 1. taking care of pupils (.88); 2. social training (.82); 3. problem and conflict resolution (.81).

B. Participatory values (PARTIVAL). What, in your opinion, would improve your working situation?: 1. increased participation in teacher team works (.71); 2. increased participation from society and work life outside the school (.68); 3. increased participation with colleagues (.66).

C. Seclusive values (SECLUVAL). What, in your opinion, is intruding too much on your teaching?: 1. contacts with pupil care personnel (.75); 2. contacts with colleagues (.70); 3. contacts with other personnel (.70).

Correlations between factors (decimal points omitted):

A	100		
B	24	100	
C	-11	-03	100

II PUPILS AS A SOURCE OF STRESS

A. Pupils' motivation (PUPMOTIV). What are the pupils' relations to the teaching in your classes?: 1. pupils are positive and attentive to the teaching (.82); 2. pupils are active and constructive (.78); 3. pupils are restless and lack concentration (.77).

B. Pupils' negligence (PUPNEGLI). Question as above: 1. frequent short absences from lessons (.89); 2. frequent late arrivals to lessons (.83); 3. pupils don't bring books and working materials to the lessons (.68).

C. Pupils' lack of discipline (PUPDISCI). 1: To what degree is the content of your teaching determined by a lack of discipline? (.89); 2. To what degree is the way you teach determined by a lack of discipline? (.88).

D. Pupil dissimilarity (PUPDISSI). To what degree is your work straining because of: 1. span of pupils' capacities too large (.66); 2. not having time to give individual instruction (.66).

Correlations between factors (decimal points omitted):

A	100			
B	49	100		
C	54	36	100	
D	38	25	34	100

III STAFF AND PARENTS AS A SOURCE OF STRESS

A. Relations to colleagues (RELCOLLE). What characterizes your relationship to the other teachers of your school?: 1. mutual solidarity (.79); 2. good relations and a spirit of cooperation (.69); 3. a lack of responsibility for common decisions (.64).

B. Relations to management (RELMANAG). Question as above: 1. assistance in conflicts with pupil care personnel (-.95); 2. assistance in conflicts with other personnel (-.94); 3. assistance in conflicts with colleagues (-.92).

C. Relations to pupils care personnel (RELCARPE). Question as above: 1. concordant opinions about school norms and rules (.74); 2. mutual solidarity (.69); 3. different views on how to carry out school work (.68).

D. Relations to parents (RELPAREN). Question as above: 1. different views on pupils' care measures (.68); 2. different views on teaching methods (.67); 3: open opposition and conflicts (.63).

E. Relations to other personnel (RELOTHPE). Question as above: 1. mutual solidarity (-.76); 2. good relations and a spirit of cooperation (-.72); 3. help and assistance when encountering difficulties (-.57).

Correlations between factors (decimal points omitted):

A	100				
B	-18	100			
C	36	-22	100		
D	28	-03	35	100	
E	-39	32	-33	-31	100

IV LACK OF INFLUENCE AS A SOURCE OF STRESS

A. Lack of influence over organizational issues (LOIORGAN). What issues do you feel you have too little influence over?: 1. choice of class and student group (.75); 2. choice of work task (.62); 3. choice of collaborators (.55).

B. Lack of influence over teacher methods (LOITEACH). Questions as above: 1. choice of teaching method (.82); 2. planning of your teaching (.81); 3. choice of textbooks and teaching aids (.54).

C. Lack of influence over miscellaneous issues (LOIMISCE). Question as above: 1. the physical environment of the school (.84); 2. the social climate of the school (.78); 3. further education (.59).

Correlations between factors (decimal points omitted):

A	100		
B	31	100	
C	49	13	100

V MISCELLANEOUS SOURCES OF STRESS

A. Lack of personal facilities (LOPEFACI). Is there a lack of the following facilities at your school?: 1. changing-rooms (.69); 2. resting-places (.67); 3. sanitary facilities (.63).

B. Time pressure (TIMEPRES). 1. To what degree is the content of your teaching determined by time pressure? (.88); 2. To what degree is the way you teach determined by time pressure (.77).

C. Lack of classroom facilities (LOCLFACI). Is there a lack of the following facilities at your school?: 1. classrooms (-.72); 2. storage-room for teaching aids (-.53); 3. storage-room for pupils' working material (-.52).

D. Noise (NOISE). To what degree are you bothered by the following inconveniences during your work day?: 1. bad sound-proofing (.72); 2. bad acoustics (.60); 3. noise (.53).

Correlations between factors (decimal points omitted):

A	100			
B	16	100		
C	-43	-16	100	
D	38	16	-44	100

VI SOCIAL SUPPORT

A. Support from central school agencies (CENTSUPP). Do you get support and help in managing your working situation from?: 1. central school administration (.82); 2. school board (.76); 3. advisory officers (.70).

B. Support from the union (UNIOSUPP). Whom do you turn to when you need support and help in your working situation?: 1. local representative (.88); 2. security representative (.76); 3. Do you get support and help from the local representative to manage your working situation? (.74).

C. Support from the school staff (STAFSUPP). Do you get support and help to manage your working situation from?: 1. colleagues (.80); 2. management (.69); 3. To whom do you turn when you need support and help in your working situation - colleagues (.59).

Correlations between factors (decimal points omitted):

A	100		
B	41	100	
C	29	26	100

VII REACTIONS TO THE SOURCES OF STRESS

A. Work is stimulating and interesting (WORKSTIM). Do you experience your work as?: 1. stimulating (.83); 2. interesting and captivating (.81); 3. creative (.73).

B. Work is trying and fatiguing (WORKTRYI). Questions as above: 1. trying (.59); 2. fatiguing (.57); 3. uncomfortable (.53).

C. Work is unhealthy and dangerous (WORKUNHE). Question as above: 1. unhealthy (.62); 2. dangerous (.60).

Correlations between factors (decimal points omitted):

A	100		
B	-11	100	
C	-40	31	100

VIII HEALTH

A. Mental disorders (MENTDISO). What mental disorders have been bothering you during the last twelve months as a result of your work?: 1. inability to engage in leisure activities (.72); 2. feelings of anguish (.71); 3. worry and restlessness (.67).

B. Medical treatment (MEDTREAT). How frequently have you, as a consequence of work related health troubles,?: 1. visited a doctor (1.03); 2. taken medicine (.58); 3. been on sick leave (.46).

C. Psycho-somatic symptoms (PSSOSYMP). What somatic health troubles have been bothering you during the last twelve months as a result of your work?: 1. headaches (.63); 2. stomach troubles (.47); 3. voice troubles (.43).

Correlations between factors (decimal points omitted):

A	100		
B	50	100	
C	67	33	100

APPENDIX 2

A PARTIAL LISTING OF FACTOR ITEMS MEASURING THE SOCIOECONOMIC STATUS OF THE SCHOOL NEIGHBOURHOOD (Principal component analysis with oblique rotation; item loadings shown in parentheses).

A. Social status (SOCISTAT). 1. Percentage of immigrants (.97); 2. Percentage of people on social security (.87); 3. Percentage of public housing (.79).

B. Economic status (ECONSTAT). 1. Percentage of large apartements (.90); 2. Percentage of villas (.90); 3. Percentage of large incomes (.72).

Correlations of factors (decimal points omitted):

A 100

B -21 100

APPENDIX 3

A LISTING OF FACTOR VARIABLES MEASURING (I) NEIGHBOURHOOD CHARACTERISTICS, (II) TEACHER CHARACTERISTICS, (III) RELATIONAL SOURCES OF STRESS, (IV) ORGANIZATIONAL SOURCES OF STRESS, (V) SOCIAL SUPPORT, (VI) REACTIONS TO THE SOURCES OF STRESS, AND (VII) HEALTH (Principal component analysis with oblique rotation; variable loadings shown in parentheses).

I NEIGHBOURHOOD CHARACTERISTICS

A. Socio-economic status of the neighbourhood (NEIGHBOU). 1. SOCISTAT (.90); 2. ECONSTAT (.90).

II TEACHER CHARACTERISTICS

A. Education in human matters and participatory values (HUMEDUC and PARTIVAL). 1. HUMEDUC (-.51); 2. PARTIVAL (.52).

B. Seclusive values (SECLUVAL). 1. SECLUVAL (.41).

III RELATIONAL SOURCES OF STRESS

A. Pupils as a source of stress (PUPILS). 1. PUPMOTIV (.82); 2. PUPDISCI (.67); 3. PUPDISSI (.66); 4. PUPNEGLI (.54).

B. Staff and parents as a source of stress (STAFF/PA). 1. RELOTHPE (.70); 2. RELCARPE (.61); 3. RELCOLLE (.59); 4. RELMANAG (.48); 5. RELPAREN (.43).

IV ORGANIZATIONAL SOURCES OF STRESS

A. Physical environment as a source of stress (PHYSENVI). 1. LOCLFACI (.79); 2. LOPEFACI (.63); 3. NOISE (.54); 4. TIMEPRES (.31).

B. Lack of influence as a source of stress (LOINFLUE). 1. LOIORGAN (.95); 2. LOITEACH (.49); 3. LOIMISCE (.46).

V SOCIAL SUPPORT

A. Social support (SOCISUPP). 1. UNIOSUPP (.81); 2. CENTSUPP (.72); 3. STAFSUPP (.72).

VI REACTIONS TO THE SOURCES OF STRESS

A. Reactions to the sources of stress (REACTION). 1. WORKUNHE (.80); 2. WORKTRYI (.73); 3. WORKSTIM (-.69).

VII HEALTH

A. Health (HEALTH). 1. MENTDISO (.89); 2. PSSOSYMP (.67); 3. MEDTREAT (.57).

APPENDIX 4

CORRELATIONS, MEANS AND STANDARD DEVIATIONS FOR MANIFEST MODEL VARIABLES. VARIABLES MARKED BY * RECODED TO A 3-POINT ORDINAL SCALE (N=599).

	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	y11	y12	y13	y14	y15	y16	y17	y18	y19	y20	y21	y22	y23	y24	x1	x2	x3	x4	x5	x6
y1 : PUPDISCI	100																													
y2 : PUPMOTIV	57	100																												
y3 : PUPNEGLI*	42	50	100																											
y4 : PUPDISSI*	42	53	33	100																										
y5 : RELPAREN	29	34	24	22	100																									
y6 : RELCOLLE	09	12	07	05	31	100																								
y7 : RELMANAG	04	11	05	-01	15	21	100																							
y8 : RELCARPE	11	17	20	08	33	30	29	100																						
y9 : RELOTHPE	14	18	11	09	36	40	32	33	100																					
y10: LOIORGAN	22	18	13	16	15	19	20	19	18	100																				
y11: LOITEACH*	19	22	16	06	13	14	14	14	05	40	100																			
y12: LOIMISCE	13	14	02	11	07	16	15	15	18	49	22	100																		
y13: TIMEPRES	15	13	10	11	27	28	24	21	27	20	14	18	100																	
y14: LOPEFACI	02	08	-01	09	05	15	18	17	06	14	02	19	23	100																
y15: LOCLFACI	18	24	19	25	15	15	14	20	15	15	08	21	26	50	100															
y16: NOISE	20	20	16	28	11	18	07	12	06	15	08	17	24	32	43	100														
y17: CENTSUPP*	-03	-10	-01	-07	01	-14	-20	-10	-13	-14	-05	-24	-06	-15	-14	-13	100													
y18: UNIOSUPP*	-02	-03	05	03	-01	-11	-17	62	-11	-08	-04	-15	-04	04	02	00	44	100												
y19: STAFSUPP	-06	-15	-03	-04	-15	-41	-44	-25	-25	-24	-16	-19	-16	-16	-07	-13	32	30	100											
y20: WORKTRYI*	29	26	10	31	09	10	11	-01	12	16	05	15	18	19	23	20	-13	-01	-11	100										
y21: WORKSTIM*	-32	-42	-24	-31	-17	-06	-13	-15	-11	-17	-13	-21	-15	-13	-21	-15	12	04	17	-21	100									
y22: WORKUNHE*	37	29	23	30	11	11	09	13	09	20	14	10	19	17	21	28	-01	05	-09	39	-26	100								
y23: MENTDISO*	40	36	22	36	19	20	17	12	16	20	16	14	26	15	17	25	-04	-02	-20	43	-28	43	100							
y24: PSSOSYMP	33	34	13	36	13	14	11	14	14	18	10	17	23	22	22	33	-07	04	-14	35	-23	38	59	100						
x1 : SOCISTAT	-17	-23	-20	-17	-07	04	-09	-09	-03	00	-04	-09	02	-11	-26	-11	01	-06	-03	-06	05	-15	-09	-11	100					
x2 : ECONSTAT	-19	-19	-25	-24	-06	06	05	01	-03	-04	-03	-02	06	00	-06	-04	-04	02	-09	-02	06	-10	-08	-04	43	100				
x3 : AGE	-06	00	04	-01	-21	-11	-10	-07	-25	-10	-04	-15	-07	-01	-13	03	06	04	-06	04	-03	03	11	-02	17	07	100			
x4 : HUMEDUC	-23	-19	-05	-25	-19	-16	-03	-06	-18	-16	-09	-24	-25	-23	-26	-19	13	07	00	-24	13	-17	-20	-23	13	05	24	100		
x5 : PARTIVAL	02	-01	07	09	06	15	01	-08	10	-04	-03	-04	07	05	14	05	12	10	16	01	13	-04	-04	-0?	-12	-11	-25	-25	100	
x6 : SECLUVAL	28	22	27	32	09	05	06	13	04	15	10	09	23	12	18	27	-06	06	-10	20	-15	24	19	25	-02	-08	08	-07	-08	100
Mean	2.2	2.4	1.8	2.0	2.3	2.2	3.0	2.2	2.5	3.1	1.7	3.9	3.0	2.2	2.5	1.9	1.4	1.9	3.7	2.0	1.9	1.8	2.0	2.2	88	24	2.4	2.4	2.1	2.8
S.D.	.96	.75	.69	.70	.46	.62	1.1	.61	.69	.86	.61	.82	.64	.72	.75	.58	.48	.68	.86	.72	.63	.67	.77	.78	11	17	1.0	.71	.45	.40

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